

## Claims

- [c1] What is claimed is:
1. A shallow trench isolation (STI) method for semiconductor processes, the method comprising:
- providing a substrate having a top surface;
  - forming a trench-patterned mask layer on the top surface exposing an unmasked trench region of the substrate, the mask layer comprising a pad oxide layer, and a silicon nitride layer formed on the pad oxide layer;
  - etching the unmasked region of the substrate to form a trench in the substrate;
  - depositing a high temperature oxide (HTO) film over the substrate, the HTO film covering the trench and the mask layer;
  - depositing a dielectric layer that fills the trench and covers the HTO film;
  - planarizing the dielectric layer to expose the silicon nitride layer; and
  - stripping the silicon nitride layer;
- wherein the HTO film reinforces an interface between the dielectric layer and the substrate to prevent acid penetration and acid-corroded seams forming during the acid solution dipping process.
- [c2] 2. The method of claim 1 wherein the HTO film is formed by a low-pressure chemical vapor deposition (LPCVD) process, the LPCVD process utilizing a  $\text{SiH}_2\text{Cl}_2/\text{N}_2\text{O}$  gas system, a pressure of 0.4 Torr, and a temperature between 700 °C and 850 °C.
- [c3] 3. The method of claim 1 wherein the HTO film has a thickness between 50 and 250 angstroms.
- [c4] 4. The method of claim 1 wherein the dielectric layer is a high density plasma (HDP) oxide layer.
- [c5] 5. The method of claim 1 wherein before stripping the silicon nitride layer, the method further comprises performing a silicon oxide etching process to remove residual silicon oxide from the silicon nitride layer and to simultaneously etch the dielectric layer in the trench.
- [c6] 6. The method of claim 1 wherein the acid solution dipping process uses a

| Year | Age | Sex | Height | Weight | Length | Wing | Tail | Culmen | Gape | Toe | Middle toe | Claw | Weight of egg | Weight of chick | Weight of adult | Weight of egg | Weight of chick | Weight of adult |
|------|-----|-----|--------|--------|--------|------|------|--------|------|-----|------------|------|---------------|-----------------|-----------------|---------------|-----------------|-----------------|
| 1911 | 1   | ♂   | 100    | 100    | 100    | 100  | 100  | 100    | 100  | 100 | 100        | 100  | 100           | 100             | 100             | 100           | 100             | 100             |
| 1912 | 1   | ♀   | 100    | 100    | 100    | 100  | 100  | 100    | 100  | 100 | 100        | 100  | 100           | 100             | 100             | 100           | 100             | 100             |
| 1913 | 1   | ♂   | 100    | 100    | 100    | 100  | 100  | 100    | 100  | 100 | 100        | 100  | 100           | 100             | 100             | 100           | 100             | 100             |
| 1914 | 1   | ♀   | 100    | 100    | 100    | 100  | 100  | 100    | 100  | 100 | 100        | 100  | 100           | 100             | 100             | 100           | 100             | 100             |
| 1915 | 1   | ♂   | 100    | 100    | 100    | 100  | 100  | 100    | 100  | 100 | 100        | 100  | 100           | 100             | 100             | 100           | 100             | 100             |
| 1916 | 1   | ♀   | 100    | 100    | 100    | 100  | 100  | 100    | 100  | 100 | 100        | 100  | 100           | 100             | 100             | 100           | 100             | 100             |
| 1917 | 1   | ♂   | 100    | 100    | 100    | 100  | 100  | 100    | 100  | 100 | 100        | 100  | 100           | 100             | 100             | 100           | 100             | 100             |
| 1918 | 1   | ♀   | 100    | 100    | 100    | 100  | 100  | 100    | 100  | 100 | 100        | 100  | 100           | 100             | 100             | 100           | 100             | 100             |
| 1919 | 1   | ♂   | 100    | 100    | 100    | 100  | 100  | 100    | 100  | 100 | 100        | 100  | 100           | 100             | 100             | 100           | 100             | 100             |
| 1920 | 1   | ♀   | 100    | 100    | 100    | 100  | 100  | 100    | 100  | 100 | 100        | 100  | 100           | 100             | 100             | 100           | 100             | 100             |
| 1921 | 1   | ♂   | 100    | 100    | 100    | 100  | 100  | 100    | 100  | 100 | 100        | 100  | 100           | 100             | 100             | 100           | 100             | 100             |
| 1922 | 1   | ♀   | 100    | 100    | 100    | 100  | 100  | 100    | 100  | 100 | 100        | 100  | 100           | 100             | 100             | 100           | 100             | 100             |
| 1923 | 1   | ♂   | 100    | 100    | 100    | 100  | 100  | 100    | 100  | 100 | 100        | 100  | 100           | 100             | 100             | 100           | 100             | 100             |
| 1924 | 1   | ♀   | 100    | 100    | 100    | 100  | 100  | 100    | 100  | 100 | 100        | 100  | 100           | 100             | 100             | 100           | 100             | 100             |
| 1925 | 1   | ♂   | 100    | 100    | 100    | 100  | 100  | 100    | 100  | 100 | 100        | 100  | 100           | 100             | 100             | 100           | 100             | 100             |
| 1926 | 1   | ♀   | 100    | 100    | 100    | 100  | 100  | 100    | 100  | 100 | 100        | 100  | 100           | 100             | 100             | 100           | 100             | 100             |
| 1927 | 1   | ♂   | 100    | 100    | 100    | 100  | 100  | 100    | 100  | 100 | 100        | 100  | 100           | 100             | 100             | 100           | 100             | 100             |
| 1928 | 1   | ♀   | 100    | 100    | 100    | 100  | 100  | 100    | 100  | 100 | 100        | 100  | 100           | 100             | 100             | 100           | 100             | 100             |
| 1929 | 1   | ♂   | 100    | 100    | 100    | 100  | 100  | 100    | 100  | 100 | 100        | 100  | 100           | 100             | 100             | 100           | 100             | 100             |
| 1930 | 1   | ♀   | 100    | 100    | 100    | 100  | 100  | 100    | 100  | 100 | 100        | 100  | 100           | 100             | 100             | 100           | 100             | 100             |
| 1931 | 1   | ♂   | 100    | 100    | 100    | 100  | 100  | 100    | 100  | 100 | 100        | 100  | 100           | 100             | 100             | 100           | 100             | 100             |
| 1932 | 1   | ♀   | 100    | 100    | 100    | 100  | 100  | 100    | 100  | 100 | 100        | 100  | 100           | 100             | 100             | 100           | 100             | 100             |
| 1933 | 1   | ♂   | 100    | 100    | 100    | 100  |      |        |      |     |            |      |               |                 |                 |               |                 |                 |

[c7] 7.The method of claim 1 wherein a 160 ° C phosphoric acid solution is used to strip the silicon nitride layer.